

# Deep Brain Stimulation (DBS)

## Colen Surgical Medi-Card

### What is a Deep Brain Stimulation?

Deep Brain Stimulation (DBS) involves the surgical implantation of electrodes into the brain to stimulate deep brain structures. These electrodes send small electrical signals to the targeted area of the brain providing an effective therapy for the correction of movement disorders (e.g. Parkinsonian tremor). The electrode stimulators are usually implanted into the subthalamic nucleus or the globus pallidus interna, structures that are involved in the regulation of movement. These tiny electrical signals are similar to those emitted by a cardiac pacemaker (Figure 2).

### What are the indications? When is it used?

DBS is indicated for patients suffering from the severe tremors associated with Parkinson's disease; especially when the medications used to control these tremors are ineffective, or their side effects are intolerable to the patient.

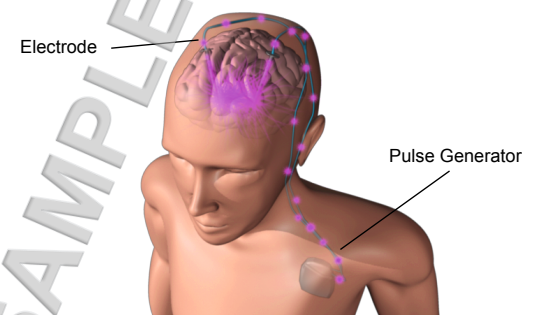


Figure 1: Surgically implanted deep brain stimulator electrodes and battery pulse generator in the right shoulder.

### What are the possible complications?

As with all major surgical procedures, complications can arise. Some of the most common complications following DBS include:

- **Infection** - Post-operative infection is rare, but may become serious if left untreated.
- **Intercranial Bleeding or stroke**
- **Complications from anesthesia** (the anesthesiologist will discuss this with you)
- **Continued pain**
- **Numbness**
- **Nerve damage**
- **Weakness**
- **Death**

*\*This is not intended to be a complete list of all possible complications.*

### What happens after the surgery?

After DBS implantation surgery, you will likely be required to stay in the hospital for 1-2 days, although this can be longer if the battery pulse generator was also implanted, allowing adequate time to fine tune the newly inserted device.

You are likely to experience incisional pain following the procedure. This pain can be managed with oral analgesics or narcotics. You should attempt walking as early as possible to help prevent blood clots from forming in the legs.

Over time, your body will heal and the pain will subside. Incisional pain accompanied by swelling, redness, discharge, numbness, or flu-like symptoms (e.g. fever/chills) should be reported to your doctor immediately.

According to your surgeon's preference, dissolving stitches, sutures, or staples may be used to close the incision. Sometimes, small, adhesive strips (*Steri-Strips*) that are made to come off on their own as the incision site heals are used. Surgical dressings covering the incision may be removed prior to discharge from the hospital. Normal wound care during the post-operative period requires keeping the incision clean and dry. You will usually be able to shower, but baths are not advisable since soaking the wound should be avoided until after your first follow-up appointment with your doctor (usually about 2 weeks after your operation).

Healthy foods, especially those high in protein, should be eaten unless your doctor tells you otherwise.

If the battery pulse generator was not inserted along with the DBS electrodes, it will typically be placed within 1-2 weeks after surgery. At that point, the electrode will be turned on. Proper adjustment of the electrode takes some time and is achieved through continued monitoring of clinical symptoms. During the gradual programming process, the patient's medication will slowly be reduced. Ultimately, both the type and quantity of medication may be changed.

### What is involved in the recovery time?

Patients recover fairly quickly after DBS, and are normally discharged from the hospital 1 to 2 days after surgery. It is normal that patients will experience jerking (ballistic) and writhing movements (choreoathetosis) anywhere from 3 days up to 2 weeks after the surgery.

I have read and understood the content presented in this brochure. All my questions regarding this surgical procedure have been answered satisfactorily.

PATIENT'S SIGNATURE

DATE

Disclaimer: The content presented in this brochure may vary from the actual surgical procedure.

Developed by:  
Colen Publishing, L.L.C.

#### Authors:

Chaim B. Colen, M.D., PhD.  
Roxanne E. Colen, PA-C

#### Illustrators:

Kevin Rakes  
Scott Rakes



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#### Faculty Reviewer:

Setti S. Rengachary, M.D.

#### Editors:

Elizabeth Furest  
Natalie Mandziuk

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DBS is also indicated for patients diagnosed with essential tremor (ET) which has failed to be controlled by medication and significantly impairs their daily activities. Other movement disorders such as dystonia, multiple sclerosis tremor, post-traumatic tremor, cerebral palsy, and Tourette's syndrome tics can be managed by DBS as well. Additionally, researchers are now exploring the possibility of using DBS to treat depression and other psychiatric disorders.

### What are the benefits?

DBS is most effective in reducing tremor related disorders, particularly in the arm on the opposite side from the DBS electrode.

When tremors are the result of multiple sclerosis or essential tremor, besides reducing the arm tremor, DBS may also reduce tremor of the head and legs. Yet, it is the reduction of tremor in the arm that should remain the most important factor when electing to have the surgery.

Parkinson's disease related tremors are reduced (by DBS), most notably in the arm. DBS also improves the arm's speed and dexterity and inhibits the involuntary movements that may occur as side effects of the medications taken to treat Parkinson's disease. DBS can also reduce the "off time" experienced by Parkinson's disease patients when medications become ineffective. It may, as well, reduce the quantity of medication needed for the adequate management of a Parkinson's disease related tremor.

The longevity of DBS's effectiveness makes the treatment especially desirable. It has been shown to relieve Parkinson's disease related tremor and essential tremor for upwards of 6 years.

Remember, DBS does **NOT** halt the progression of Parkinson's disease or multiple sclerosis.

### How will I prepare for the surgery?

The decision to proceed with DBS must be made collectively by you, your movement disorder expert (usually a neurologist) and your surgeon. You should attempt to understand as much as possible about the procedure. Always talk to your doctor if you have any questions or concerns.

DBS should only be pursued after an adequate trial of medication. A patient with Parkinson's disease, for instance, will probably use the medications, *levodopa* and *carbidopa* (Sinemet) as an initial treatment. Essential tremor is sometimes effectively treated with a type of drug called a beta-blocker.

Once you and your doctor have agreed that surgery is the most appropriate course of action, you will most likely be required to undergo a complete physical examination, performed by your primary doctor. This examination will help to evaluate if your body is able to physically tolerate the upcoming operation. Let your doctor know if you are currently taking any medications. Before surgery you should **avoid using** medications that **act as antiplatelet agents** (e.g. aspirin, Plavix®) or **blood thinners** (e.g. Coumadin®, heparin). These can increase bleeding during the operation.

You should **stop smoking at least 2 weeks** prior to any operation since it can interfere with the healing process.

On the day of your surgery, you will likely be admitted into the hospital early in the morning. **You should not eat or drink anything after midnight the night before your surgery.**

### What happens during the surgery?

The DBS surgery lasts for about 4 hours. The patient is partially sedated, but awake for most of this time. The patient's head is held still in a frame, and pictures of the brain are taken using MRI or CT imaging techniques. From these images, the precise location of where to insert the DBS electrode (in the brain) is determined. At this point, the patient, still in the frame, is prepped for surgery (e.g. clipping some hair if necessary, cleansing the skin, and draping the patient to create a sterile field in which the surgeon will work).

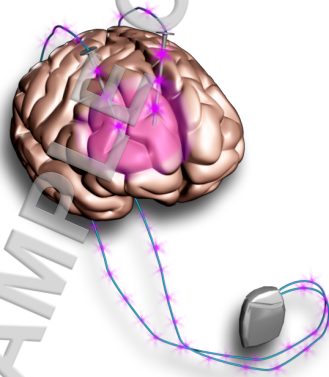


Figure 2: Electrodes sending signals to targeted area of the brain.

When the procedure begins, a small hole is made in the patient's skull. An electrode is then inserted into the brain to measure the rate of brain cell activity (Figure 3). Cells in different parts of the brain emit electrical signals at varying rates. The measurement of these rates, a practice known as *microelectrode recording*, allows the surgeon to confirm the precise location for DBS electrode placement. The DBS electrodes are placed inside the brain, the incision is closed, and the patient's head is removed from the frame. Finally, the patient is placed under a general anesthetic, so that the pulse generator can be positioned under the skin, just beneath the collarbone.

The tiny wire from the DBS electrode is threaded under the skin of the neck in order to connect the battery pulse generator (Figure 1). Some surgeons might place the battery pulse generator at a later date, which requires a second surgery.

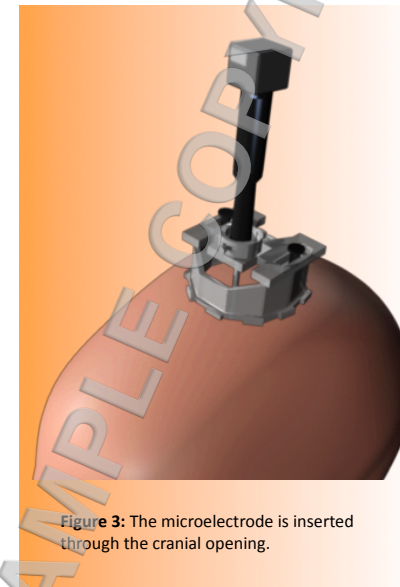


Figure 3: The microelectrode is inserted through the cranial opening.